NASA'S RESPONSE TO THE COMMITTEE'S INVESTIGATION OF THE "CHALLENGER" ACCIDENT

HEARING

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ONE HUNDREDTH CONGRESS

FIRST SESSION

FEBRUARY 26, 1987

[No. 7]

Printed for the use of the
Committee on Science, Space, and Technology

U.S. GOVERNMENT PRINTING OFFICE
73-330 WASHINGTON : 1987

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

H701-53

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

ROBERT A. ROE, New Jersey, *Chairman*

GEORGE E. BROWN, JR., California
JAMES H. SCHEUER, New York
MARILYN LLOYD, Tennessee
DOUG WALGREN, Pennsylvania
DAN GLICKMAN, Kansas
HAROLD L. VOLKMER, Missouri
BILL NELSON, Florida
RALPH M. HALL, Texas
DAVE McCURDY, Oklahoma
NORMAN Y. MINETA, California
BUDDY MacKAY, Florida
TIM VALENTINE, North Carolina
ROBERT G. TORRICELLI, New Jersey
RICK BOUCHER, Virginia
TERRY BRUCE, Illinois
RICHARD H. STALLINGS, Idaho
BART GORDON, Tennessee**
JAMES A. TRAFICANT, JR., Ohio
JIM CHAPMAN, Texas
LEE H. HAMILTON, Indiana
HENRY J. NOWAK, New York
CARL C. PERKINS, Kentucky
TOM McMILLEN, Maryland
DAVID E. PRICE, North Carolina
DAVID R. NAGLE, Iowa
JIMMY HAYES, Louisiana
DAVID E. SKAGGS, Colorado***

MANUEL LUJAN, JR., New Mexico*
ROBERT S. WALKER, Pennsylvania
F. JAMES SENSENBRENNER, JR., Wisconsin
CLAUDINE SCHNEIDER, Rhode Island
SHERWOOD L. BOEHLERT, New York
TOM LEWIS, Florida
DON RITTER, Pennsylvania
SID W. MORRISON, Washington
RON PACKARD, California
ROBERT C. SMITH, New Hampshire
PAUL B. HENRY, Michigan
HARRIS W. FAWELL, Illinois
D. FRENCH SLAUGHTER, JR., Virginia
LAMAR SMITH, Texas
ERNEST L. KONNYU, California
JACK BUECHNER, Missouri
JOEL HEFLEY, Colorado
CONSTANCE A. MORELLA, Maryland

HAROLD P. HANSON, *Executive Director*
ROBERT C. KETCHAM, *General Counsel*
REGINA A. SNYDER, *Chief Clerk*
R. THOMAS WEIMER, *Republican Staff Director*

---

*Ranking Republican Member.
**Resigned February 19, 1987 (H. Res. 89).
***Elected March 30, 1987 (H. Res. 133).

CONTENTS

WITNESSES

February 26, 1987:	Page
Dr. James C. Fletcher, Administrator, National Aeronautics and Space Agency; Mr. Dale Myers, Deputy Administrator, NASA; Rear Admiral Richard Truly, Associate Administrator for Office of Space Flight, NASA; Mr. Arnold D. Aldrich, Director, Space Shuttle Program, NASA; Mr. Aaron Cohen, Director, Lyndon B. Johnson Space Center, NASA; and Mr. J.R. Thompson, Director, Marshall Space Flight Center, NASA	3

NASA'S RESPONSE TO THE COMMITTEE'S INVESTIGATION OF THE CHALLENGER ACCIDENT

THURSDAY, FEBRUARY 26, 1987

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The committee met, pursuant to notice, at 10:36 a.m., in room 2318, Rayburn House Office Building, the Honorable Robert A. Roe (chairman of the committee) presiding.

Staff Present: Mr. Robert C. Ketchum, General Counsel.

Mr. ROE. The hearing will come to order, and we want to extend our greetings, ladies and gentlemen, today as we examine the National Aeronautics and Space Administration's response to the recommendations contained in this committee's report on the investigation of the Challenger accident.

I want to welcome Dr. Jim Fletcher and his associates and Admiral Truly—and we are going to identify the rest of you folks for the record—to today's proceedings.

Our cursory observation of the report from NASA gives us good feelings and looks to be substantive. Of course, there are a number of comments and observations that different members have made and will make, I'm sure, and a number of questions we have in mind, but we think it's a step definitely in the right direction.

There are some matters that will come up, and I think that we want to be right up front. We are concerned in the announcement from NASA yesterday in reference to the Thiokol program, and I know members want to speak to that issue, and I trust that we can get that right up front, because it's an issue that was raised rather substantively, as you remember, during our investigative oversight process.

So we are anxious to hear from you what the substance and background to that matter is and what your findings and recommendations are.

So again, we want to welcome you. I feel today is an extremely important hearing, particularly to bring this committee up to date as the new year is getting going, so we can jointly use our energies and resources to achieve the goal of getting America back into space, and that is what our goal is, of course.

Before we go onto the formality of the hearing, I defer to the distinguished representative from New Mexico, our minority leader, Mr. Lujan.

Mr. LUJAN. Thank you very much, Mr. Chairman, and I want to join you in welcoming all of the people from NASA this morning.

I commend NASA for their efforts in complying with the Rogers Commission recommendations. They have taken a number of actions that will make the shuttle program a safer and stronger program in the future, and I think they have done very well with that.

There are some subtler issues raised by the committee in its report that dealt more with attitudes than with procedures, and I think, Mr. Chairman, often you've said, you know, we deal with a question of perception, rather than actually what might be done. But it's not clear from the response to the committee that there is a full understanding of the committee's concerns.

For example, that they appreciate the concerns of the committee regarding the drive to establish the shuttle as a cost-effective, routine space transportation system. And I guess, you know, that the concern is that NASA might still be looking at the shuttle operation as routine, that it's not seen as strictly the experimental vehicle, and that we still talk about so many flights per year.

And I recognize that it's much more difficult to deal with those kinds of issues than to change procedures or fix a hardware problem. I believe it's also going to be much more difficult for us to provide the needed oversight in the months and years ahead, because there are indications in the Congress, in the entire Congress—I was going to say the committee, but it has been pointed out by members outside the committee—that to avoid another 51L, we have to supervise NASA a lot closer, and certainly that isn't very good—well, I think maybe good oversight is good—but the detail that people want to go to, how to design the solid rocket motor and how often you test it and those kinds of things, I think—and there are people talking about those things—but we need to resist that temptation and focus instead on ensuring that NASA remains the center of excellence for advanced aeronautics and space technology.

The shuttle can properly be a valuable tool for helping NASA achieve its goals, but the successful and economical operation of the shuttle should never be viewed as the primary agency goal, and I believe that is the lesson that we should have learned from 51L.

Thank you very much, Mr. Chairman.

Mr. ROE. I thank the distinguished gentleman.

Now, Dr. Fletcher, if you would be kind enough first to introduce your colleagues for the record, and then we would recognize you for your opening statement.

Those microphones, in this technology age, we're going to have to try to get fixed in this committee, so if you would be kind enough to keep them close to you, at least we can hear what you're saying for us.

STATEMENTS OF DR. JAMES C. FLETCHER, ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION; MR. DALE MYERS, DEPUTY ADMINISTRATOR, NASA; REAR ADM. RICHARD TRULY, ASSOCIATE ADMINISTRATOR FOR OFFICE OF SPACE FLIGHT, NASA; MR. ARNOLD D. ALDRICH, DIRECTOR, SPACE SHUTTLE PROGRAM, NASA; MR. AARON COHEN, DIRECTOR, LYNDON B. JOHNSON SPACE CENTER, NASA; AND MR. J.R. THOMPSON, DIRECTOR, MARSHALL SPACE FLIGHT CENTER, NASA

Dr. FLETCHER. Thank you, Mr. Chairman. Yes, sir.

To begin with, Mr. Chairman, I would like to introduce the members of the NASA team that are here with me at the table.

On my left, your right, is, as you know, Deputy Administrator Dale Myers, and on my right, your left, is Admiral Truly, who has been with you several times before, and he is the Associate Administrator for Space Flight, which includes the space transportation system called the Shuttle. To his right is Arnie Aldrich, who is the Program Director for the Space Shuttle, and we have moved Arnie, as you know, to be the Program Director at headquarters. We also have a bevy of folks who are supporting us, and they saved two seats at the table for them, depending on what issues are involved. But we have, among others, J.R. Thompson, who is the new Center Director at Marshall Space Flight Center, and we have people from Thiokol. We have our General Counsel. I'm not going to introduce everybody behind us, but I think we have enough people here, so that we can answer almost all of your questions on the subject of the meeting, but also having to do with Mr. Lujan's comment on perceptions of how we're doing and also your earlier comment on the recent negotiations on the Morton Thiokol contract.

So I hope we have enough to be able to answer your questions.

Mr. Chairman, I have a very short statement before Admiral Truly gives his testimony, and it's so short, if you wouldn't mind, I would just like to read the statement as is, rather than presenting it for the record.

Mr. ROE. If the Director will proceed.

Dr. FLETCHER. All right. It's been over a year since the Challenger accident, and since that time, NASA, its contractors, and many elements of the Nation's scientific and technical community have been deeply involved in the efforts to recover from the accident and to return the Space Shuttle program to safe flight status. And notice I didn't use the word "team," Mr. Lujan; we don't use that word anymore.

We have received and responded to the report from the Presidential Commission on the Challenger accident, and we have given you all a copy of that. We have also responded to the recommendations in the report from this committee, and my copy looks like this, and I assume it's similar to the one you got.

A large amount of work is involved in accomplishing all of the specific recommendations contained in these two reports. But we agree with the findings. And as far as your review is concerned, we are implementing all 73 of the recommendations of your committee and, of course, the 9 recommendations of the Rogers Commission.

So we are not only responding but implementing every one of those recommendations.

The status of the implementation, of course, is varying, depending on how far along—some of them are going to take a long time to fix, but we are in the process of implementing every one of them.

I recognize the great amount of work that the committee has done in the preparation of the report on the Challenger accident, and I believe the report reflects your interest in the shuttle program and your commitment to ensuring an early return to safe—and I emphasize the word "safe"—safe shuttle flight.

The continuing support of the Congress, as you know, is absolutely essential to not only a successful shuttle program, but more importantly to an effective civilian space program.

The NASA response to the committee report, which was sent to you last week, approximately on schedule, Mr. Chairman, a couple of days one way or the other, provides a summary description of the programmatic activities that we have undertaken since the accident, and it includes the status of the response to the specific recommendations of the Rogers Commission and a description of the major events planned prior to a resumption of Space Shuttle flights, next year's activities.

Since the Space Shuttle Challenger accident on January 28th of last year, NASA has undertaken a large number of activities which are designed to strengthen the agency and to assure that the Space Shuttle program is on a comprehensive course that will provide a safe return to safe flight. What I'm trying to say here is, we've strengthened the entire NASA agency, not just the Shuttle program.

But we're here today to talk about the Space Shuttle. One of the first actions was to initiate a system design review—we call it SDR; NASA likes acronyms—of all program flight hardware, software, ground support equipment, in order to establish those items which require redesign, analysis, or testing prior to the first flight.

Teams were formed for solid rocket booster design, solid rocket motor, which, as you know, is one side of the booster. The booster includes two motors and the inter-ties. It includes the redesign; it includes an evaluation of all the failure modes and effects analysis—we call it FMEA—the critical items list, which we call CIL—again more acronyms—landing safety, launch aborts and launch activities, crew escape, flight rate, and maintenance safeguards.

Actions were taken to strengthen NASA management and communications and also our safety, reliability, and quality assurance program, and we will have more to say about that later.

Following the recommendations of the Phillips Study and Captain Crippen's report on the Space Shuttle management and communications, we have initiated a number of organizational changes designed to strengthen program management, improve communications, and to help ensure that we have the strongest possible management team in place to be sure that we return to a safe, sustainable level of Shuttle flight.

Now in addition to the changes that we have made in the Space Shuttle management, NASA is restructuring its safety, reliability and quality assurance organization. The responsibility for main-

tainability has been added to the functions of this office, and a new position of Associate Administrator for Safety, Reliability, Maintainability, and Quality Assurance—we keep adding words to it—George Rodney's title is SRM&QA now—but nevertheless, that's what it is—has been established at NASA headquarters, and Mr. George Rodney has been established at NASA headquarters in that position. Additional manpower and budget resources have been made available to strengthen the SRM&QA elements and their various activities throughout the Shuttle program and throughout NASA. This is the Centers as well as headquarters. Most of the strengthening has been at the Centers, the additional people and so forth.

The SRM&QA personnel at headquarters and at the Centers are actively involved in the process of recertifying the shuttle for first flight through involvement in SRB redesign, the FMEA/CIL reviews and other activities—techniques to provide a checks-and-balances capability to ensure that appropriate safety and quality assurance considerations are factored into the redesign are also being developed.

I think a little explanation is required here. The way you get safety and reliability and quality assurance is to design it into the system to begin with. That's the best way. Having done that, though, you always want to check up and make sure that the reporting requirements on difficulties along the way are handled and taken care of. So the SRM&QA function has both design and followup responsibilities.

I believe that the changes we have made, along with constant program review and management attention—and also, I might add, Mr. Chairman, the support of this committee—will help us achieve an early return to safe shuttle flight. I have asked Admiral Truly to discuss in more detail our response to the committee report, since his folks have mostly been involved in putting this report together, and also the action he is taking to strengthen the shuttle program generally. And after Admiral Truly has presented his testimony, we will be glad to answer any questions the committee may have.

Thank you, Mr. Chairman.

Mr. ROE. Thank you, Dr. Fletcher.

The Chair recognizes Admiral Truly for his response.

[The prepared statement of Dr. James C. Fletcher follows:]

NASA
National Aeronautics and Space Administration

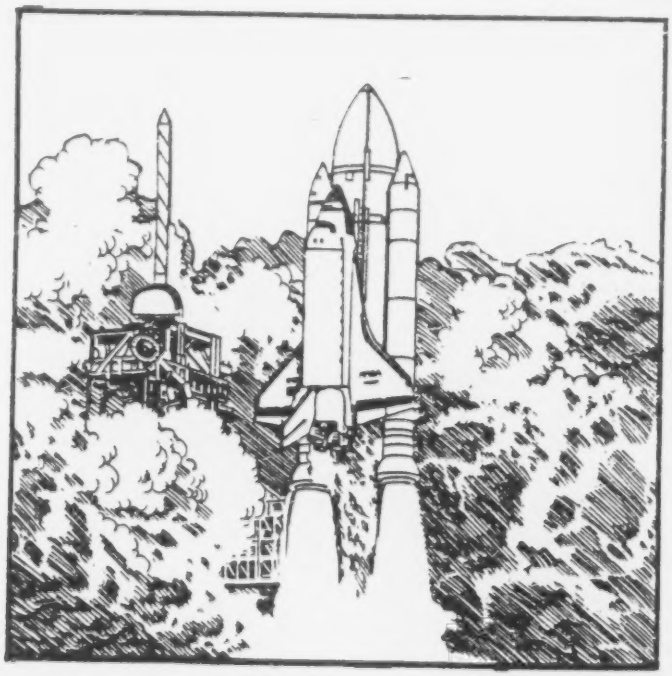
Hold for Release Until
Presented by Witness

February 26, 1987

Committee on Science, Space and Technology

House of Representatives

Statement by:
Dr. James C. Fletcher
Administrator



100th Congress

Statement of

Dr. James C. Fletcher
Administrator

National Aeronautics and Space Administration

before the

Committee on Science, Space and Technology

United States House of Representatives

Mr. Chairman and Distinguished Members of the Committee:

It has been just over a year since the Challenger accident. Since that time NASA, its contractors and many elements of the Nation's scientific and technical community have been deeply involved in the efforts to recover from the accident and to return the Space Shuttle Program to safe flight status.

We have received and responded to the report from the Presidential Commission on the Challenger accident. We have also responded to the recommendations in the report from this Committee. While a large amount of work is involved in accomplishing all of the specific recommendations contained in these two reports, we agree with the findings and are implementing all 73 of the recommendations of the Committee report and the nine recommendations of the Rogers Commission .

I recognize the great amount of work done by the Committee in their preparation of the report on the Challenger Accident. I believe the report reflects your interest in the Shuttle Program and your commitment to ensuring an early return to safe Shuttle flight. The continuing support of the Congress is essential to not only a successful Shuttle Program but more importantly to an effective civilian space program.

The NASA response to the Committee report which was sent to you last week, provides a summary description of the programmatic activities undertaken since the accident, including a status of the response to the specific Recommendations of the Rogers Commission and a description of the major events planned prior to a resumption of Space Shuttle flights.

Since the Space Shuttle Challenger accident on January 28, 1986, NASA has undertaken a large number of activities which are designed to strengthen the agency and to ensure that the Space Shuttle Program is on a comprehensive course that will provide a return to safe flight. These activities have covered all aspects of the program, both technical and managerial.

One of the first actions was to initiate a System Design Review (SDR) of all program flight hardware, software, and ground support equipment to establish those items requiring redesign, analysis, or testing prior to first flight.

Teams were formed for solid rocket booster (SRB) redesign, evaluation of failure modes and effects analysis/critical items list (FMEA/CIL), landing safety, launch and launch aborts, crew escape, flight rate, and maintenance safeguards. Actions were taken to strengthen NASA management and communications and our safety, reliability, and quality assurance program.

Following the recommendations of the Phillips study and Captain Crippen's report on Space Shuttle management and communications, we have initiated a number of organizational changes designed to strengthen program management, improve communications and help ensure that we have the strongest possible management team in place to assure return to a safe, sustainable level of Shuttle flight.

In addition to the changes which we have made in Space Shuttle management, NASA is restructuring its safety, reliability and quality assurance organization. The responsibility for maintainability has been added to the functions of this office. A new position of Associate Administrator for Safety, Reliability, Maintainability and Quality Assurance (SRM&QA) has been established at NASA Headquarters and Mr. George Rodney has been appointed to that position. Additional manpower and budget resources have been made available to strengthen SRM&QA elements and activities throughout the Shuttle Program and NASA.

The SRM&QA personnel at headquarters and at the NASA centers are actively involved in the process of recertifying the Shuttle for first flight through involvement in SRB redesign, FMEA/CIL reviews, and other activities. Techniques to provide a check and balance capability to ensure that appropriate safety and quality considerations are factored into the redesign are also being developed.

I believe that the changes we have made, along with constant program review, management attention and your support will help us achieve an early return to safe Shuttle flight. I have asked Admiral Truly to discuss in more detail our response to the Committee report and the actions he is taking to strengthen the Shuttle Program. After Admiral Truly has presented his testimony we will be glad to answer any questions the Committee may have.

###

Admiral TRULY. Thank you, Mr. Chairman. With your permission, I would like to submit my printed testimony for the record and make some oral comments.

Mr. ROE. No objection. So ordered. The statement will appear in full in the record.

Admiral TRULY. Thank you, sir.

I feel today that the report we made is part of my response, and as Mr. Lujan said, sometimes it's difficult to get into printed word the feelings and the impressions of where I think we are, and with your permission, I'd like to structure my comments to give you my view of where we are today in a general, broad sense, and then we can get into any specifics of our response as we go.

I would like to discuss three broad areas, if I could. First, the area of organizations and documentation efforts that we have underway; secondly, the status of our technical progress in hardware decisions that we have made; and finally, I'd like to talk a little bit about schedule and make a couple of comments about flight rate. And then at the end, I would also like to recognize very briefly that in the time that we had to make this report—although, frankly, I'm very proud of it—there are a number of your questions that we didn't answer, and I know what they are, and I want to tell you what we're doing to complete that work.

First, on the area of organizations and documentation, there is a tremendous amount of progress that has been made since the accident and, as a matter of fact, since the latter part of last year, and it is real, not imagined.

We reorganized the Space Shuttle program last fall, and the principal center of this reorganization was the strengthening in Washington in my office at headquarters of the program management. We reinstituted the position of Director of the Shuttle program, and again, that's not a sign on the door; it's Arnie Aldrich, who we got to come up from his previous job in Houston, to move to Washington and direct the program from here.

We have created in this organization a line organization. Arnie has two Deputies. One is Dick Kohrs, who is also here, who is his Deputy for Programs, and the other, Bob Crippen, who cannot be here this morning, but is his Deputy for Operations. Below them within the program are the Project Managers at the various Centers, at the orbiter in Houston, the propulsion elements at Marshall.

Further, we have revitalized what we call the Office of Space Flight Management Council, and the majority of that council is here with us today. The Council is made up of myself and the Center Directors from Marshall, Kennedy, Johnson, and NSTL.

J.R. Thompson has already been introduced. Aaron Cohen, the Director of the Johnson Space Center, is here today. Tom Utsman, the Deputy Director of the Kennedy Space Center, is here today to help answer your questions. General Forrest McCartney, the Director of the Kennedy Space Center, could not be here. We have a Delta launch scheduled this evening and with a GOES weather satellite on top. We had to scrub that last night because of an unusual wind condition. The launch is set at 6:05 p.m. this evening. The spacecraft and the vehicle are go, and the weather forecast is about the same, perhaps a little improved as of now, but we're hoping to

launch that Delta this evening, and that has kept Forrest at the Cape.

We have tremendous efforts going on, sometimes I think crushing workload efforts on people, with regard to document reviews and rewrites. We have a tree of documentation that is being really redone in the Shuttle program, and it starts with a program approval document, an agreement between the Administrator and myself on the broad areas that I'm responsible for in managing the program, and it can't be changed unless I go back to the Administrator and negotiate a change in it.

Below that, there's a series of documents called the program requirements documents that have other annexes, and below that, we have what we call a Volume 7700, which are the actual detailed requirements for the system.

That entire tree, many documents really both at the headquarters level and at the Program Manager's level, is being redone with a one-for-one correlation between broad requirements to general Level 1 requirements to technical requirements. The documentation tree deals not only with technical requirements like O-rings and turbine blades and those things, but also with management, how we run flight readiness reviews, how we run Program Requirements Change Boards. All of that is being readdressed. It's very real and a lot of work.

We have reviewed and are reviewing our flight rules and our launch commit criteria, so that as we come closer to launch, we will be assured that we're all working to the same sheet of music.

Down at the Cape, we are reviewing our operations and maintenance instructions, and by the time all the books are redone and reprinted for those people who will need them, it's literally millions of pages of technical detail to get right down to the step number and the call-outs that we use in the vehicles.

All of these organization changes are tied into another very important NASA change, and that is the creation that Dr. Fletcher mentioned of an AA for SRM&QA, George Rodney, and George is here today. Even though his is an independent organization from the Shuttle, we work very closely together. His quality people are co-located from top to bottom within our project offices, and he is building up his capability, as are we, together, as we move through this effort.

Now I'd like to turn to the second broad area, which is where I see technical progress that's been made in some hardware decisions. I can't cover them all, but I will cover a few examples that I know have gotten a lot of attention, both in the public and in this committee.

Obviously first is the solid rocket motor. We have selected a design approach. We have baselined a test program. We have already built and are using new test facilities. We have other test facilities, that are presently under construction. We have done a good bit of early testing and comparing the testing to our analysis, although it is not always one-for-one, nor would any sane person expect it to be. We believe that it is all on the right track. We have a good design.

We have accomplished four joint evaluation simulator tests so far in the program out at Morton Thiokol and two nozzle joint eval-

uation simulator hydroburst tests on the 51L hardware and on some parts of the new design.

The first full-scale motor is scheduled for March 25th, next month. That is not of the new design. It's an engineering test motor that is of the 51L steel case design, although there are some insulation designs that are directly applicable to our new design. March 25 is the schedule for that.

After that, all of our full-scale motor firings, both on our present stand and our newly approved stand, will be of the flight configuration.

Before leaving the solid rocket motor, I would like to address two other areas, one of which you mentioned earlier, that either have happened recently or are in progress, that I know you will want to know about.

The first is the Memorandum of Understanding that you referred to, the agreement on principle between NASA and Morton Thiokol, that was announced a couple of days ago. This is an agreement on principle. It is not a final negotiation. Now what is required is a proposal to NASA from Morton Thiokol, and a negotiation of this proposal will occur over the next few months, although I have not been directly involved in the day-to-day work in this issue, it's my understanding that we hope to get this finally put to bed in October.

The second thing I wanted to mention was, as you know, in the next 30 to 40 days we are required to come to you and report on our plan which has resulted from our various studies that we have had undertaken with a number of different solid rocket motor contractors, about what our plan is for the future, either for new designs for improvements or an advanced motor or contractual arrangements. And we are working very hard to be on schedule to report to you.

The only thing I would add from my view is to assure you that there is nothing in the agreement on principles in this memorandum of understanding that ties NASA's hands in any way with regard either to future design of advanced motor or improvements or to contractual arrangements.

But we look forward to finishing that. It's been a lot of work and presenting that proposal to you here at the end of March, I think it's scheduled.

There are lots of other hardware changes in work. In the orbiter, we have about 30 changes that we have defined and approved prior to first flight. In the past month or six weeks, we've made major progress in making the hardware delivery schedules coming out of Rockwell and their subcontractors fit with Cape checkout schedules, which gives me a little more confidence in that one area, that the flight schedule, if we can have a good test schedule, could be accomplished.

In the area of landing safety, we have approved changes to the brakes. We have funded new carbon brakes for the system. We have approved a mod in stiffer axles to the orbital landing gear, modifications to the nose wheel steering. We have major tire tests underway at Langley and planned at Wright-Patterson Air Force Base, and we have selected new and longer runway abort sites and runway barrier systems for short runways, although we have not—

Arnie may correct me—but I think we have not at this time baselined which runways that we would put barriers on. But we are moving on the design.

In the area of crew escape, as you know, there has been a tremendous amount of interest. We have completed an early study. We have made one hardware decision, and that is to modify the side hatch of the orbiter with a manually-operated and pyro-technically-actuated device, so that the hatch can be removed in a hurry.

In a very limited flight regime—that is, stable gliding flight—that would provide the opportunity for the crew to bail out the side. However, one of the things that made me believe that that was a good change is that we're going to be operating this machine for the next 20 or 25 years. We are going to be making a lot of landings, and there are a lot of potential—not planned, but potential incidents that could occur on a runway where a rapid emergency egress would provide more safety. We have done that. We're funding it. We have not committed for that to be on the first flight; however, we are committed to doing everything we can to make it available for the first flight, and, as a matter of fact, yesterday Arnie, in his Program Requirements Change Board, authorized the Cape to pull the hatch on OV-103, so that we can send it back to Rockwell and begin early modifications.

I personally feel comfortable, even though the schedules are not worked out yet, that we can make first flight, and we're trying.

I would like to pay particular attention to the space shuttle main engine program and to, in front of you, give some congratulations to some of our people in the test program that's going on.

We have been in heavy testing on three engine stands with a total of four engines since the 51L accident. We have conducted, as of this morning, 55 main engine tests since 51L. We have accumulated in these tests over 19,000 seconds of test time. As a matter of fact, our fleet leader engine right now has over 20,000 seconds of test time total on it. In the main engine program, since the beginning, we have conducted almost 1,200 engine tests and have accumulated over 231,000 seconds of engine test time. The reason that I point this out to you is not that we don't have some engine problems, because we do. But we do have alternate designs on the drawing boards for them, and they are in development testing, and we have people here today, if you have specific questions, that can deal with this subject in a lot more detail than can I.

We have put a major emphasis on logistics. We have enhanced funding for it, real dollars. We have told the contractors that we want to concentrate those dollars on spare parts, not on people. We have a brand new facility at the Cape that I hope, when you visit Cape Kennedy, that you will be able to see, that is designed for fast handling of spare parts and logistics to support the orbiter system. I can assure you that management attention, starting with me and Arnie and Aaron Cohen and Forrest McCartney and right down the system, is being paid to this problem, not only in NASA, but also at Rockwell.

Rockwell has reorganized their organization to elevate the manager for the logistics program, and we are doing everything we can, so that when we get back to flight, we have a plan that will avoid totally cannibalization, although I have told you in testimony

before, and I want to emphasize again, that in any airplane, truck, car, or spacecraft problem, it will be impossible to never have a single incident where we have to cannibalize a part from another orbiter, but we're paying a lot of attention, and it's not lip-service; it's real.

The only thing that I would mention to you in closing—on my remarks about a general overview of the hardware status is, is that, as Dr. Fletcher mentioned, it got kicked off by a series of system design reviews. We are in the midst of a huge effort on failure modes and effects analysis. We think that analysis has turned up some very minor changes, but no major ones so far. We are going to go through it to its end and end with a complete design recertification of the system, but I frankly know of nothing in the cards with regard to a big hardware change that we don't know about today that's coming out of that analysis, although it will be going on for many months.

All of this work has been under the oversight of, at least the solid rocket motor, under the oversight of the Oversight Committee of the National Research Council, which we work with routinely, headed up by Dr. Guy Stever; in the area of failure modes and effects analysis, by another oversight committee of the NRC, headed up by Gen. Al Slay. We have gotten good advice from them in a number of areas. We haven't agreed with them on every point, but we continue to work with them, and in no case have we ignored any of their advice. We are working closely with them, and I anticipate that we will continue to do so right up until flight time.

The last subjects that I wanted to cover had to do with schedule, and I'd like to make a couple of comments about flight rate.

We are targeted for February 1988, which is the schedule that this program has been on since last June. It's my personal opinion, but it is subjective and I can't prove it, that by the insistence that we work to a schedule that we have already saved ourselves two or three months, because we have thousands of people in numerous program offices and in contractors that have to have an integrated schedule to work their problems.

We have had a lot of problems that have come up. Some disconnects between hardware deliveries, for example, as much as five or six months between the Cape need dates, when we started. But by having the schedule, we can bubble up these disconnects, and either put more people, more management attention, or more money on those particular items.

I don't know if we are going to make February 1988 or not. It's a very difficult schedule and, frankly, I don't care, because I want to fly when we are ready. We do need a strong emphasis from the top on the schedule. It's very tight, it's getting tighter, but we are not making dumb decisions in response to schedule.

I've had a long conversation, just yesterday, with George Rodney on this very subject. He reminded me that if he sees us making decisions he's not going to like, he's going to be the first to holler, but I hope he doesn't have to, because we are on the same wavelength. If we need to adjust it, we will.

I personally think that the data is beginning to come in in the front end of these large test programs that we are going to be getting into in the next few months, and with more knowledge of our

hardware deliveries, that we will be able to either agree that this is the right schedule, or adjust it.

There are some added content issues that are threats to the schedule. There is a proposal, for example, for us to do a flight readiness firing prior to the first flight, as a confidence builder for the entire team. That in itself needs to be worked out and would add probably several weeks to the schedule.

We do not have enough data to make that decision yet. Arnie is working with the program to define precisely what such a test would be, so we are not losing schedule time, we are not ignoring the problem, but before the program approves such a thing, we want to know what we're buying into and what we're going to get out of it.

So I think what we're doing makes sense to me, it makes sense to the Center directors who are here to speak for themselves, and to the Program director, but there is no safety pressure on this schedule. We're going to fly, as we've said time and again, when we're ready, and I'm comfortable with where we are now.

On the subject of flight rate, there are those that can deal with this issue in more detail than I. Early after the accident, and after I came onboard, I think it was late last spring or summer, without the benefit of any studies, we had to begin to build a budget, and so we made some fairly arbitrary flight rate decisions for budgetary purposes.

Later in the year, another NRC committee studied flight rate for us, and came up with their assumptions that underlay their proposals on flight rate, which they provided to us, and a projected flight rate that builds up, as I recall, to a flight rate of 12 to 14 per year. After that, and with the benefit of the NRC study, we finally came to the end of a major program, bottoms to—bottoms to top study, starting with things like Cape turn-around flows, overtime, maintainability requirements, and so forth, and made our own flight rate study, which came out in the general area of 12 to 14 flights per year.

We have talked about it within the program. We have planned improvements that we think as a goal that we can do a little bit better than that, and so our outyear projections out in 1993, 1994, after we have the fourth Orbiter, we are projecting a maximum of about 16 flights per year as a planning figure. That does not affect our funding here in the front end or the ramp-up. And, frankly, the actual flight rate will be delivered based on flight experience. So that's the best I can tell you.

I think again we are doing something that is reasonable. We are not ignoring any of your advice. We can go through with you precisely in the NRC study the assumptions that they made, what our study showed, and how we got to our numbers. So it's not a contentious issue at all with me, it's just what the program plan should be.

The final thing before I close is to make the comment that there are nine specific areas in your large report of your investigation that we are unable in this report to respond to you on.

I have a list of those nine, I know what they are. I have target dates for them. I will be pleased to provide them to you so you will know what we are trying to meet. But I must tell you that frankly

one of the threats that I see this year is literally the workload on our people, both our senior management people and the people that are grinding through these various requirements that we have. But we do know specifically what this list of items is that we couldn't make here at this point in our deliberations. I do have a schedule. I have names assigned to the schedule, and we hope to be working with you to turn that in.

That's the end of my remarks, sir.

[The prepared statement of Admiral Truly follows:]

NASA
National Aeronautics and Space Administration

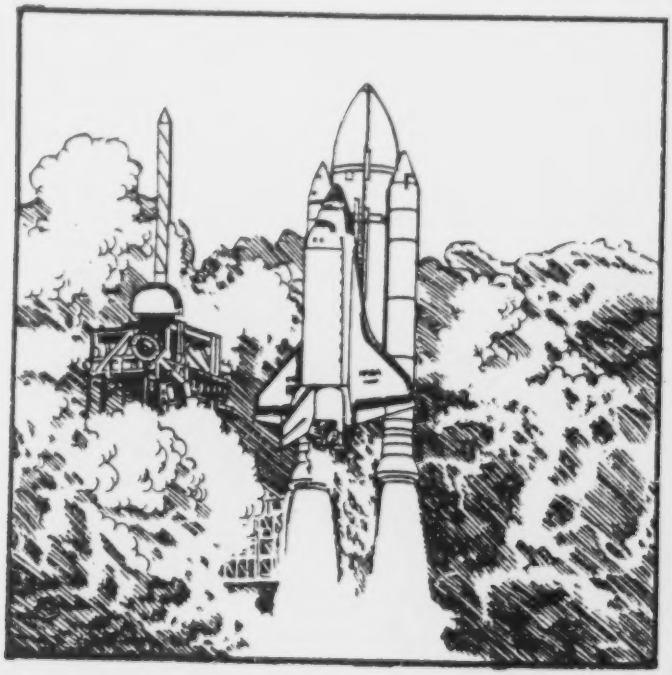
Hold for Release Until
Presented by Witness

February 26, 1987

Committee on Science, Space and Technology

House of Representatives

Statement by:
Richard H. Truly
Associate Administrator
for Space Flight



100th Congress

HOLD FOR RELEASE UNTIL
PRESENTED BY WITNESS

Statement of

Richard H. Truly
Associate Administrator
Office of Space Flight

National Aeronautics and Space Administration

before the

Committee on Science, Space and Technology
Committee on Science and Technology
House of Representatives

Mr. Chairman and Distinguished Members of the Committee:

As Dr. Fletcher has stated, we have accepted and are implementing the Committee recommendations.

The National Space Transportation System (NSTS) return-to-flight activities are progressing satisfactorily. There is a significant amount of work involved in the process, and the activities are spread across all elements of the program, including the analysis, design, and testing associated with the response to the specific recommendations of the Committee and of the Rogers Commission, as well as many additional efforts that we have determined must be completed prior to first flight.

I would like to summarize these activities prior to providing specific responses to your questions. A preferred design approach for the solid rocket motor (SRM) has been selected, and the redesign and testing requirements have been established. The Preliminary Requirements Review and the Preliminary Design Review have been conducted, and the results are being incorporated into the SRM performance specification. The test program and required supporting facilities are being established and testing is under way.

The joint redesign includes a capture feature and an additional O-ring which are being incorporated to reduce joint defection and improve sealing capacity. NASA is reviewing the process inspection and nondestructive evaluation requirements and will incorporate any additional techniques that

are required to assure proper SRM assembly and performance.

The National Research Council (NRC) oversight committee and an independent NASA/contractor review group are intimately involved in all SRM activities, and their observations, comments, and recommendations are being considered in each step of the redesign process.

The NSTS program structure has been extensively changed, and overall management of the program is now being exercised from NASA Headquarters. Mr. Aldrich, Director, NSTS, is in Washington and has overall responsibility for the management of the program. He has two deputies--the Deputy Director, NSTS Program, a Headquarters employee located at JSC, who has responsibility for the day-to-day management of the Program; and the Deputy Director, NSTS Operations, also a Headquarters employee to be located at KSC, who is responsible for all operational aspects of the program.

All program documentation is being reviewed and rewritten as necessary to assure that the program structure is well defined and that the authority of each individual and their lines of communication are well understood by each element of the program.

The program is conducting an extensive review of all critical items. The Failure Modes Effects Analysis (FMEA's) are being reanalyzed, and all waivers for Criticality 1, 1R, 2, and 2R items have been cancelled and all are being resubmitted for approval. This process is being reviewed by the NRC oversight panel and by the Aerospace Safety Advisory Panel.

Landing safety is being reviewed, and a systems analysis of the landing system is being conducted. Several significant modifications to the landing system are being incorporated for first flight, and others will be incorporated later to provide the desired margin. A thick stator beryllium brake has been approved for first flight, and a structural carbon brake is being designed for long-term implementation. Changes to the hydraulic system and stiffening of the main gear axle to decrease brake damage on landing are being incorporated for first flight. Nosewheel steering system gains and modifications to the anti-skid system for first flight are being verified in a series of simulations in the Ames Research Center Vertical Motor Simulator.

The NSTS program office has reviewed all aspects of the launch phase and the associated launch abort modes. The launch commit criteria and flight mission rules are being reviewed and rewritten as necessary to assure that they reflect the desired conservatism associated with the overall safe return to flight philosophy.

Crew escape is being aggressively pursued. Several options to provide crew escape capability are being assessed, and the associated design and wind tunnel activities are under way.

A bottom-to-top review of flight rate capability has been conducted which considered all aspects of the flight preparation process, including vehicle inspections and modifications requirements, payload constraints, launch intervals, flight preparation, and standard processing flows.

We are conducting a complete review of all Operational Maintenance

Requirements and Specifications Document (OMRSD) requirements, and this review, in conjunction with the FMEA/CIL reviews, is being used to review and rewrite the Operations and Maintenance Instruction (OMI's) at KSC. The OMI's for all Criticality 1 items will require design center concurrence.

Program requirements are being developed for systems integrity and assurance. As part of this effort, a Systems Integrity Assurance Program Plan (SIAPP) is being developed to ensure design center involvement in launch processing center maintenance and operations activities and to provide visibility into hardware status, work progress, and technical issues. The SIAPP will provide an accounting of all configuration and maintenance requirements and provide the overall trend monitoring and analysis capability for the program, both the NSTS and Safety, Reliability, Maintainability, and Quality Assurance (SRM&QA) organizations.

We are conducting a series of Design Review Requirements (DRR's) to assure that program hardware and software are designed, built, certified, and maintained in a manner consistent with program requirements. This activity will culminate in a program Design Certification Review to assure that the program hardware and software is certified for first flight.

Mr. Chairman, I have reviewed the Committee report and its recommendations and can assure you that all recommendations which pertain to the Office of Space Flight activites are being implemented, and those necessary to be completed prior to return to safe flight will be completed.

We would be happy to answer your questions.

Mr. ROE. I want to thank you, Admiral Truly, for your lucid presentation.

Let me suggest that I have missed a housekeeping matter here, if the committee will indulge me. Without objection, television broadcast, radio broadcast, still photography, and other means of coverage will be permitted during the Full Committee hearing today, if there's no objection.

The second thing that—I want to make an observation. I want to thank you, first of all, for your presentation. The committee is aware that there are items that are going to take a little bit more time to get into to get us the response, and we respect and understand that, and we appreciate your submitting that for the record.

[The material referred to follows:]

OUTSTANDING ACTIONS TO THE HOUSE COMMITTEE ON
SPACE, SCIENCE, AND TECHNOLOGY

	ACTION	TARGET DATE
1.	Prepare a cost benefit analysis of testing a SSME to destruction.	June 1, 1987
2.	Prepare a comprehensive review of the Range Safety System requirements.	June 1, 1987
3.	Provide results of review of the SPC contract.	April 1, 1987
4.	Prepare a logistics management and budgetary plan.	June 1, 1987
5.	Prepare report on crew survival options.	May 1, 1987
6.	Develop description of Shuttle risk management program.	August 15, 1987
7.	Describe SRM&QA organizations, goals, and resource requirements.	April 15, 1987
8.	Provide SRM&QA staff and resource requirements for NASA and contractor organizations.	July 1, 1987
9.	Provide analysis on adequacy of safety quality incentives in Shuttle contracts.	June 1, 1987

Mr. ROE. From the Chair's point of view, before we go into the questioning process, it might be well worthwhile to sum up a few points. I think, number one, in our investigative oversight review we made last fall, we were concerned with the hardware aspect, particularly what caused the accident, from that point of view. And I think the second point that was terribly important to us was the management structure.

Now I'm sure there's a number of members on this committee that have reviewed the report recently submitted, and there is some concern about the management process. We are concerned about whether we are just—the appearances, and I realize it is difficult to translate into written language what you're doing. You made that point yourself, I think Dr. Fletcher made that point. But there is a general concern that there's not enough clarity there. We're concerned whether we're going to a process adding more levels, check boxes, the whole bit. We're concerned about the gutsy point of getting right down into the area, what did we do before, how was it successful, are we just exacerbating the problem. We are concerned with the management. I want to let other members speak to that issue, and I'm sure they will.

The Chair wants to take a broader view, though, and I'll hold some of my own personal questions for a little bit later. But the committee is looking at this overall program. It's not just getting the shuttle back into flight. That is not our only concern. The committee has to take a highly involved and broader view, based upon the point of view of the flight rate. We have testified before the Budget Committee recently, and those were some of the questions that were asked us, because some of the funding that we are asking for in different areas relates directly to that issue.

There's a broader national issue involved, on 60 or 70, whatever the number is, of satellites that are waiting on shelves, and I'm thinking of the Hubble Telescope and the Mars Observer and all of that, to—was to relate to flight scheduling. And by no means does the committee, or do I, wish to imply at this point that we are pressuring you to get the shuttle up, because the shuttle isn't our only access to space, as you are well aware. And the committee has asked the Budget Committee to consider three ELVs to be able to accelerate the program, and we feel that there is an investment that the American people have made in this program, and it's our responsibility to keep this program moving and get a return on that investment, above and beyond the point of keeping our leadership in space, which is, by all means, on rocky shoals at the moment.

The Chair looks at the issue to be what we do in a safe, reasonable flight schedule; how we relate the shuttle flight schedule and ability as it relates to the Space Station, which I know that subcommittee chairman Mr. Nelson has been working on most diligently, and his counterpart from Pennsylvania, Mr. Walker; and then I hope that we would get before you our concern with the relationship of a fleet of Orbiters, not the concentration being made alone on the fourth Orbiter. Because obviously we are going to be equally as concerned that all of the innovations and the improvements that are being developed and designed for the fourth Orbiter, the new Orbiter, will certainly have its counterrelationship to

the three that are in stock. And that includes bringing them up to the highest level of proficiency in equal safety proportions.

I would hope that that process is being planned and worked in parallel to what we are doing now, so that we will have a system, a shuttle system and a fleet. That's what the American people are concerned about.

Now enough from me at that particular point.

There's one other issue, I think, that should be brought right out now, and you brought it up yourself, Admiral Truly did, in reference to the—the Thiokol agreement has now become an issue, for whatever the reasons may be, and I think it would be advisable that those documentations and memoranda of understanding that you have now, I believe, now consummated would be made available to the committee—as quickly as possible. So if there's no objection, I ask unanimous consent that the—Dr. Fletcher be directed to submit a copy of that memoranda and considerations and understanding to the committee as quickly as possible.

Now having said that, I will defer my personal questions and defer to the distinguished gentleman from New Mexico, the Honorable Mr. Lujan.

Mr. LUJAN. Thank you, Mr. Chairman.

One of your—in part of your statement, Admiral Truly, you talked about the team that you put together to review all the critical lists—what do you call that, critical item lists, CIL—CIL's. All right.

One of my original concerns was that we had how many, 745 criticality one and 2000 criticality two, and I thought at that time—and maybe we discussed it—that when you are inundated with 745 items of—really critical items and 2000 of less critical, you are just inundated and you can't do anything. Is that being addressed, maybe prioritizing them, and say, well—frankly, I would not have prioritized the—the seals that went wrong, the rings that went wrong, as the number one item. I would have thought that it was the engines one of these days, that that's what was going to go. So maybe the thing that goes wrong isn't necessarily what's going to be number one on the list.

But is in this review that you're having, is somebody looking at that, that maybe that can be reduced or prioritized?

Admiral TRULY. Yes, sir. And I'm glad you asked that question. That also was a specific comment that came to us from our NRC Oversight Committee, and I will ask Arnie Aldrich to speak directly to it, because he has that specific action. But we are presently addressing, not only within the program with Mr. Rodney's organization, several suggested ways to—that we could prioritize and make sense to senior managers, so we can make sure we put our attention in. Arnie, would you please speak to that.

Mr. ALDRICH. Yes. We felt the need for this, as you indicated, and it was also a very strong initial focus of the Slay Review Panel from the NRC, and for the last several months we have been developing and reviewing five different techniques for FEMA/CIL prioritization. I've reviewed each of them in some detail, and several of them, I think, are very promising in terms of being useful to us. They have been submitted not only by the technical organizations, but also by SRM&QA.

The current status is we plan within just a few weeks to pick one and to move out with it across the program. To make that selection, we have currently several test cases on selected systems, both at Johnson and at Marshall underway, so we can compare the five techniques, and see which one serves us best over a wide range of types of systems and components. And we are about to implement that in the program, and if we find it, I believe it will be very, very useful.

Mr. LUJAN. In your reorganization, you brought Mr. Aldrich up and then you put some headquarters people, Mr. Kohrs, over in Houston; Bob Crippen in Kennedy; you've got the director for Shuttle Operations at Marshall. Incidentally, he reports to Kohrs somehow, rather than back to Aldrich, but—I don't quite understand that, but you probably have your reason. I guess the thrust of my question is, how many headquarters people do you have out—out there? Obviously Center directors report directly to—to Washington, and I mentioned the two under you at Houston, and Kennedy. Who—how many do you have out there that report—

Mr. MYERS. Mr. Lujan, I'd like to make a couple of introductory ideas in this. You know we had General Phillips look at the overall management of NASA, and one of his very strong recommendations was that we bring from the Center—we had a lead center operation where we had the management of the shuttle program day-to-day operations down at Houston, and General Phillips recommended, and Dr. Fletcher and I certainly agreed, that we should have a strong headquarters management of these multi-center programs, so that there would be no possibility of the compartmentalization that we believe happened to a degree in the Shuttle program.

We've done that. We brought the Space Station management to headquarters, and we brought the Shuttle management. Arnie Aldrich is the Program Director for the Shuttle Program. He is here in headquarters. But the idea was to give that strength to the management here at headquarters, so that it was clear there were divisions like a company, company divisions, who are reporting to the boss in operating these various elements.

In the case of the Space Station, we also are bringing to headquarters immediately the activities associated with systems engineering and program planning and control. Those are the two key elements to strong management of a program. We have done that.

In the case of the Shuttle program, we had had years of the activities associated with systems engineering down at Houston, and we just didn't see how we could jerk all of those guys out of there and bring them to headquarters, so we set up Arnie as the Program Director, we set up his deputy, left him at Houston with the system engineering activity that was at Houston. That's really why there is a difference in the Shuttle program as compared to the Space Station program. We are well aware of it. With the documentation that Admiral Truly talked about, we are defining authorities and responsibilities right down through the system with the documentation and the changed management control specified, with those definitions. We believe we have an outstanding management system for the Shuttle that does give us the central management control that we have.

Now in addition to that, one of the first things I did when I got back here was emphasize the idea of the importance of the management council. Admiral Truly meets with the four Center directors that are involved in the Shuttle program on a monthly basis, usually offsite, usually at one of the Centers, so that there is a real opportunity for the Center directors to enter into the management of the process, from the standpoint of what I think of as excellence. Their job is to be sure that they've got the right people working on the job, and to be sure that we are doing everything we can from the standpoint of properly understanding the job to be done and applying the right people to it.

It's kind of the institutional issues that are involved. But in addition to that, these Center directors are people that have all had tremendous program responsibilities of their own in the past. They have the opportunity at that time to talk about any problem that they see, anything in the program. I think that has become a great success in our program management. We think that's another important key element that we've brought to the program in the changes we've made here.

Mr. ROE. The gentleman has run out of time.

Mr. MYERS. I spoke a little longer than I wanted to, but I'm really very interested in this area and it's one that we have put a lot of emphasis in.

Mr. LUJAN. Admiral?

Admiral TRULY. The only thing—pardon me, sir, very short—we counted up and I think there are only a total of eight individuals that are headquarters employees at the field centers.

Mr. LUJAN. Could you send the Committee a list of positions and what they do? It would be kind of interesting to know.

Admiral TRULY. Certainly.

[Information to be furnished follows:]

Director, NSTS Program (JSC)

Responsible for overall systems management, integration, and operation of the NSTS Program. This includes directing and controlling the scheduling and planning for the entire National Space Transportation System design, development, test production, and operation; ensuring the integration of all elements of the program into a single operational system; ensuring effective cost control of the total program; establishing and controlling system requirements and configuration; and managing the transition of specified National Space Transportation System engineering and logistics function to the Kennedy Space Center.

Deputy Director, NSTS Program (JSC)

Day-to-day management and execution of the NSTS program, including detailed program planning, direction, and scheduling and STS system configuration management. Overall responsibility for systems engineering and integration for the STS vehicle, ground facilities, and cargos.

Manager, Engineering Integration Office (JSC)

Directs the design, development, production, and test of the Space Shuttle Orbiter and associated Government furnished equipment. Also provides direction to various line organizations within the JSC to other NASA Centers and to various contractors which are involved with the Shuttle Orbiter Project. Maintains a continuous review of project technical and contractual status. Assures overall flight readiness of the Orbiter, associated facilities, and Government furnished equipment.

Manager, Operations Integration Office (JSC)

Overall management of payload integration in the NSTS. Manages the definition of mission operations support concept, detailed program planning and implementation for JSC NSTS payload hardware development; planning, coordination, and budgeting required to accommodate NSTS operational flight rate forecast. Directs coordination and planning with DOD required for integration of DOD payload and payload carriers into the NSTS and to implement the DOD NSTS operations plans. Defines overall mission objectives and requirements. Plans and directs system engineering and systems integration functions for NSTS.

Manager, Program Control Office (JSC)

Manages the overall resources and scheduling of the NSTS Program to insure effective cost control and performance. Directs the conduct of integrated reviews of major research and development. Oversees a comprehensive cost reporting and analysis program.

Manager, Shuttle Projects Office (MSFC)

Manages all phases of project planning, budgeting, scheduling, engineering design and development, testing and evaluation of the MSFC Shuttle Projects and systmes, including support equipment and facilities, and launch operations support. Interface and point of commitment on STS activity.

Deputy Director, NSTS Operations (KSC)

Responsible for all operational aspects of the mission, including vehicle preparation, mission execution, and return of the vehicle for processing for next flight. Presents Flight Readiness Review and manages the final launch decsion process.

Mr. ROE. The Chair recognizes the gentleman from Florida, Mr. MacKay.

Mr. MACKAY. Thank you, Mr. Chairman.

Gentlemen, I'd like to make a statement by way of a predicate, which I think is important to me and other members of this Committee. Then I want to ask a question about flight rate and the method in which flight rates are being determined.

The predicate is this; I think that you all are the best managers we've got. The questions I am going to ask are not at this meeting or any other meeting, not intended in any way to be adversary or to question your integrity or your confidence. I really do believe you are the best we have.

On the other hand, I was a member of this Committee before the accident. I was on the Subcommittee that had oversight responsibility. All of us that were in that position had to ask ourselves whether we did our jobs right also. Our Committee report reflects that.

I was not aware of an o-ring problem but I was aware of a lot of other problems. I was asking questions and I was getting answers that were non-answer answers. I knew that thing was flying beyond the design capability of the gear, the landing gear. I knew it was flying beyond the design capability of the engines. I knew it was flying despite uncorrected problems with the brakes and the steering, and I knew we were pushing our crews to the limit, particularly when we had weather problems and it had to land in California and being brought back, and that affected training time.

Somehow or another, I got caught up in this idea that we had to meet a flight rate schedule that we all determined, Congress was part of it, the Executive Branch was part of, the pressures from the military was part of it, the pressures from Ariane was part of it, the pressure to reduce costs was part of it, and all I want to do by way of this predicate is to say, I'm not going to be part of that again. I want that understanding. I think I'm speaking for a lot of members on this Committee.

We are not adversary to you, but we have a job in some ways that is similar to the people who have been brought in as troubleshooters in yours.

Mr. Lujan made a very important point. We have to be sure we understand where our limits of oversight are and where we have exceeded them. We are not supposed to be designing o-rings. I hope we don't do that. When we get into questions that have to do with issues like flight rate, that's our job. We made a mistake before. I think this Committee should be very, very cautious not to let it happen again.

That's the predicate. On page 28 of your response to our questions about flight rate, it seems to me you have given us an answer that is an inconsistent answer and it raises questions that we have to have answered.

Admiral Truly, you in your response talked about it. We have an NRC which is an advisory committee, which you are working with and that you respect. You have indicated a flight rate of 16 flights per year with four orbiters, which indicates all four of them are going to fly four times, or one of them is going to fly more than four. They have said, we assume one of them is going to be worked

on and you would be more realistic in talking about 11 to 13 flights a year. That's the way I read their report.

I don't believe that is a minor inconsistency. I want to identify the fact that I'm going to resist every time I see us trying to administratively set a flight schedule again. I think what you said, Admiral Truly, is absolutely right. Its got to be generated based on resources, based on maturity, based on the bottoms up and not from the top down.

I want you to know it looks to mē as if your response raises that red flag and (a) do you think that is an appropriate question for us to be asking in our oversight, and (b), what's your answer?

Dr. FLETCHER. Could I just comment before Admiral Truly?

Mr. MACKAY. You can, but I asked him.

Dr. FLETCHER. I know, but I think the language is a little bit misleading as reported. It doesn't give the impression that Admiral Truly gave earlier, that we are not just going to fly 16 flights per year until we are convinced it is safe to do so, and based on the experience in the early part of the program. I'm afraid the language doesn't reflect that.

Mr. MACKAY. Is there an inconsistency between their position and your position? They have said you are never going to reach 16 flights a year because one of them is going to be out being worked on and you have said, we are going to do it when the program matures.

Now, I'm saying are we getting back into this business about trying to pressure flight schedules and am I going to have to wonder later on whether I have asked the questions and insisted on answers again?

Admiral TRULY. Well, my response would be yes. I mean your first question is do I agree that is a legitimate oversight function and I absolutely do. I think flight rate is a key driving force in any schedule. I must remind you that the flight rate the program was driving towards prior to the accident was 24 flights per year.

The question as to whether or not there is an inconsistency between the NRC and our study, there is not an easy answer to that. It really requires a detailed briefing.

For example, we looked at each of their assumptions. For example, holidays applied. Turnaround times. When they made their study, they were in existence for many weeks. We have a lot more resources and have applied money at different points, and all I'm saying as to what we have done is we have spent a lot of time in looking at Cape planning, training schedules, certification requirements and so forth, and not arbitrarily upped the flight rate.

We have gone assumption by assumption and found differences that come out to literally be a tenth of a flight rate, a tenth of a flight per year or four tenths of a flight per year. When we added them up, we did have a difference. It was not an inconsistency, however, from the point of the view of trying to drive the flight rate up or down.

I do think that the system needs a robust flight rate. I frankly don't care whether it is 13 flights per year or 16. I believe eventually we can deliver 16. If I'm wrong, that's not going to bother me in my old age because I think we will have approached it probably

and I can look back on it and believe that nobody in this room, on this side of the table also, wants to drive the system unrealistically.

Mr. ROE. Go ahead.

Mr. MACKAY. Mr. Chairman, thank you for your indulgence. I'm worried about the practicalities of it. When you put out a manifest based on 16 per year and you get customers starting to plan on it, you get the same pressures built in that you had before. It seems to me that is in effect what is happening. We are going to have unhappy people and they are going to be very powerful people politically. You are going to have questions about whether the shuttle is reliable and we are going to be right back where we were before.

Does that concern you? I mean, you have said to us, this is the theoretically maximum attainable some years out, but in fact your customers are starting to plan on flight schedules based on 16 a year; are they not?

Admiral TRULY. Yes, sir. It does concern me. It was my job during—one of the things I did during this past year was stand in the middle of all those customers and have to do the very painful task of building a manifest where we had a tremendous demand and a very small supply, because of the combination of several instances.

However, my responsibilities are to deal with guidance from the Administrator and direction to the Director of the program and to project what we believe that we can deliver. We believe that we can deliver flight rates about up to 14 per year, but we think there are monies that we can spend in the out years in facilities, training facilities and turn around facilities at the Cape, and we can get 16 per year.

So I believe that's the proper approach but the answer to your question is, yes, sir. It does concern me because I've been in that situation in space this year.

Mr. ROE. Will the gentleman yield, because we want to go on. This question is a burning question in this Committee, because it's not just the idea again, and if the Committee will indulge me, it's not just the idea alone of what the focus and the attention is to this particular area of concern. It has to do with the fleet capability and it has to go—we have to plan now as to what that flight schedule is going to be so that we can fly down our inventory. That is essential to us and therefore, Congress has to have the best knowledge they can, the best information, I think is the point the gentleman is making, on the safety issue that is pre-determined.

We can't guess that one. Otherwise, we are going to exacerbate the problem we have right now, and that's what alternative methods do we use, so that we have a robust system that we can depend upon. Basically, that's the issue.

Dr. FLETCHER. Mr. Chairman, I think you're hitting on the right point and maybe I missed it. We do have to plan on the possibility of a lower flight rate. There's no question about that. That leaves us with some problems in those out years, in 1992 or whenever the fourth orbiter is delivered. So we have to have in our inventory enough expendables to kind of accommodate for that difference.

This addresses the mixed fleet concept which we have talked about here before. We do have to plan for an inventory of expendable launch vehicles out in that timeframe so that we can accom-

modate all of our missions, and also assume the possibility of a lower flight rate than the 16 flights per year.

On the other hand, I think Admiral Truly is absolutely right, if you are able to do that and you feel confident about 16 flights per year, you will save on that ELV.

Mr. ROE. There is one point that has to be made, which is a terribly important point that people appear to be missing all over this Congress, including the Administration. We have got to look to the contingency issue, the fundamental basic issue before this country is our capability of being in space at all.

So what we are trying to come in fair play, you know, your Agency did not ask for expendable launch vehicles in the NASA inventory, and there are reasons, we all have been around here a long time, we understand that, but having said all of that, there's one burning focal point none of us can miss and that point is that the recovery is based upon the shuttle flying, number one, and what is the shuttle's schedule, number two, and what about the fleet capability. Those are the three decisions.

We could be making a disastrous decision if we don't recognize that overall capability, as far as this country is concerned.

The Chair recognizes the distinguished gentleman from Colorado, Mr. Hefley.

Mr. HEFLEY. No questions.

Mr. ROE. The Chair recognizes the distinguished gentleman from New York, Mr. Scheuer.

Mr. SCHEUER. Thank you, Mr. Chairman.

We have all benefitted by your fine testimony and in many ways it has been encouraging. I have two questions that I am going to ask and I am going to ask them first, because in that way we can keep our answers reasonably short since we have a number of Members here.

The first question is sort of a replay of Congressman MacKay's question, and that is the problem that was highlighted by the President's Commission and by this Committee in our report, that it didn't seem to me that you responded. It may be that you responded in your hearts, it may be that you averred to it, but you did not respond to it clearly, and that is, well, to paraphrase Shakespeare, he had Julius Caesar saying to Brutus, "The fault here, Brutus, lies not in the stars but in ourselves."

The President's Report and this Committee's report were replete, were pregnant with a deeply felt feeling, commitment on the part of the Committee that the problem was not basically an engineering design problem with those o-ring seals. The problem was a problem much more of attitude, of behavior, of character, that we felt was driving NASA over a precipice ultimately, to a tragedy. The time, the year might have been uncertain but it was inevitable.

There was a lot of harsh rhetoric when you were here. We spoke very bluntly. We don't want to go over those times. It's not necessary. I think we understand each other.

It may be that—I didn't feel you responded to that. It may be because drafting report of this kind is a bureaucratic process and there are a lot of people involved. Maybe the process itself is not susceptible, but I hope you will—I think we would all like to feel

that there has been a real recognition in NASA of the problems, of NASA's own design at the top and that that has been acknowledged and thought about and remedied.

The second item I would like you to respond to is this memorandum of understanding pertaining to a contract with Morton Thiokol. This contract is in the nature of a penalty for a job not well done, for a job badly performed, a job negligently performed. I want to ask you whether this contract will be lean and mean and if it is really going to be a cost contract.

Now, cost normally means labor, materials and direct supervision of the work under the contract. Frequently, in contracts you have provisions that are included in costs of executive salaries, executive pension plans, executive travel, executive rental cars, rental of office equipment, rental of all kinds of things, depreciation of plant and equipment, but none of which are attributable to this job. None of them.

If that is kind of cost accounting that would have been applied to this job, there would be enormous profit in this job, even though as a technical matter they would be doing it at cost, but the kind of cost accounting, the kind of legerdemain, the kind of fancy footwork that has produced a lot of horror stories that we are all familiar with, that the taxpayers are outraged by, but I want to ask you, is it your intention to make this a real cost contract, lean, mean and dirty, that would include labor, materials and direct supervision?

Is it your intention to exclude such items that are not a direct cost of doing this $409 million worth of work, such as executive pensions, travel, salaries, heat, light and power depreciation of plant and equipment, that has nothing to do with this job? Is it going to be lean, mean and dirty? Is it going to be real costs in terms of strictly the labor, the materials and the supervision, that is strictly allocable to this work, when you come down to writing the contract, the fine print?

Admiral TRULY. Thank you, sir.

Mr. ROE. Admiral Truly.

Admiral TRULY. Let me try to answer both of your questions, the first one first, and I'm not a contracts person. I think I would prefer to turn over that answer to Mr. O'Brien who is here. Let me speak to the first one that you mentioned, which is the difficulty of putting into—we do live in a bureaucracy, you and we.

Mr. SCHEUER. We recognize that.

Admiral TRULY. The difficulty of putting feelings which are in this situation into our present effort, again it is something that I can only give you my opinions and my observations and the way I view it, but I'd like to do that, because I think what is going on is extremely positive.

For one thing, you see a lot of new faces. That is not necessarily because of the faces that you would have seen here a year and a half ago were not loyal Americans and good people and good engineers, but you do see a lot of new faces. You see them from the Administrator, through me, and Arnie, and as a matter of fact, at the centers and all the way through the program.

We have a tremendous amount of personal commitment as you do to make sure that the situation that we found ourselves in does

not get repeated on our watch and furthermore, we set something into place so that the people that follow us won't let it get repeated again.

I can't say much more than that, other than the observation——

Mr. SCHEUER. You have set into motion procedures that will prevent these past practices from creeping back in, these past attitudes, patterns of behavior.

Admiral TRULY. Yes, we have. But as you know, all the organization charts and procedures in the world will eventually fail if the people fail. So, all I can say is that we are committed. The thing that is most encouraging to me is that in the last several months, and I would be pleased for you to ask these center directors this same question, in the last several months, and in this program, since we have the three new center directors at the centers—with the exception of Jerry Hlass at NSTL—since we have been meeting regularly as a management council, that sends a signal not only throughout the program but throughout the support elements at the various centers and it is reflected directly in morale of the people.

Six or eight months ago, we were at a low ebb. Today, I think if you have the opportunity, and I hope you do, to go to any of the centers, to the contractors or attend any of the major tests or any other way that we could host you, I think you would feel the fever of people that have a lot to do and are working hard at it.

Mr. SCHEUER. Can you give me some feeling as to, on the second question, on the definition of cost, the kind of direction, the kind of public policy direction, that you, Dr. Fletcher, and you, Admiral Truly, will give your technicians in negotiating that contract?

This is not a usual contract. This is, in a sense, a punitive contract for failure to perform. And I hope this committee will feel and will have chance to find out, but I think we want to keep in very close touch with the way this contract is being written.

I'd like to know the kind of policy direction you are going to give your technical people when they negotiate this contract, as to whether it's going to be direct cost and direct cost only, cost attributable to this job, and excluding everything else.

Mr. ROE. Well, if the gentleman would yield, I would—it's the Chair's intention, having asked Dr. Fletcher to provide for this committee a copy of that Memorandum of Understanding, to request Mr. Nelson and his subcommittee to review that in depth, to pursue the particular issues of concern that you are raising. And I think that it is a matter now—and it's a matter of great magnitude to this committee, because of the nature of it and because of the investigative approach the committee and the Rogers Commission took—but I think that the committee needs the background, specifics, on not only what the contract says, but what are the issues involved in the sole-source versus the point of view timeframe involved, to achieve the missions and the goals that have been established by the Rogers Committee and the Congress, and is it equitable and fair, and has it met the needs and the requirements that were in the original contract in the first place, in case of a failure.

So I would like to have Mr. Nelson take that matter on and review that in depth and coordinate that with NASA, so that the American people are sure and certain that the concerns that have

been manifested by both this committee and the Administration have been met. So we intend to do that in depth.

I don't know whether the Admiral could give any response to that at this time, what kind of direction, you're asking specifically.

Admiral TRULY. Mr. Chairman, we would welcome such a hard look at our negotiations. Again, there are other people that can speak more to the details, but if another day is the appropriate time—but I welcome any look at it in any depth with what we are doing in this particular issue.

Mr. ROE. Thank you. I think that would suffice, because we're going to get into this in depth, and that's the gentleman's concern. It's the concern of the committee, and that's what we will do.

The Chair recognizes the distinguished gentleman from Florida, Mr. Nelson.

Mr. NELSON. Thank you, Mr. Chairman.

And, Mr. Chairman, I will carry out your wishes. As you know, I have encouraged you to handle this continuing investigation at the full committee level, but if you so desire, it will be our privilege to say, "Aye, aye, sir," and move out, and therefore today's questions are merely preparatory to a continuing examination that will occur with extensive hearings that will proceed after we have gotten through our NASA authorization hearings, and therefore after we've marked up, on or about March 25th, and then we will proceed with followup, Mr. Chairman Roe, to this hearing today.

I'm just going to raise a few issues here, and I would like for you to respond to them.

And by the way, Mr. Chairman, I might say that this formal kind of hearing process and the way that I will followup your wishes, that the formal hearing process is merely the tip of the iceberg, that there will be a continuing series of informal contacts and visits to Centers and having cups of coffee as we try to have the oversight process executed in the manner that you want it to be.

I want to raise the issues of overtime, involvement of development contractors, the shuttle processing contract, and spare parts.

On the issue of spare parts, after the accident, Horace Lamberth said, quote: "I think that we would have been brought to our knees this spring," which was last spring, 1986, "by this problem, spare parts, if we had kept trying to fly."

Now, Admiral Truly, do you have any clues as to how the logistics problem had reached that lamentable condition up to that point of the Challenger accident?

Admiral TRULY. I'll be honest, Mr. Nelson. I know that the program was in a logistics bind at the time of the accident. I didn't hear Mr. Lamberth make that remark. I'm sure he did; I've heard it other places.

I have tried to take the situation as I found it. In the one budget cycle that I've been through last summer, which was no small challenge in itself, we applied additional funds to it. I mentioned earlier some of the specific emphasis we're putting on it.

I think, if I might, I would like—Mr. Tom Utsman is here. Normally, when we've talked logistics earlier at the hearings that I've been at, you've been hearing from staff people from the Washington office. Mr. Utsman is the Deputy Director of the Kennedy Space Center. He's on the business end of the logistics problem,

and with your permission, if I could ask Tom to come up and comment to it, I think he'd do a much better job than I.

Mr. NELSON. Well, he's a good one. He's a good one to answer the question.

And, Tom, while you're answering that question, I want you to add to your answer, what are you doing to bring the program back on track with regard to spare parts?

The CHAIRMAN. Could we get the name and the responsibility for the record?

Mr. UTSMAN. I'm Tom Utsman. I'm Deputy Director of the Kennedy Space Center.

Mr. ROE. Thank you. Proceed.

Mr. UTSMAN. The fundamental problem that we had was that the inventory that was initially to be laid in in order to support a flight rate of about twelve lagged behind on schedule. What happened, then, is, the flight rate in late 1985 approached that, and we ended up not having the parts on the shelf, as was reported, and we were faced with, every time we'd go to the shelf, or many times when we'd go to the shelf, with the option that we'd either have to work around such as delaying that part of the testing or some other activity, and would be forced into the condition to remove another part from the vehicle. That occurred in about 25 percent of the time that we were trying to face it.

When Horace made that statement, he was looking ahead essentially to a flight rate that was somewhat increasing, and we still were lagging in the inventory layins.

Now what have we done since that time? As Admiral Truly said, we've increased the budget emphasis through the four years. While it's about a 3 percent increase, if you look at the flight rate, it's about a 60 percent decrease, and that in itself drives you to a less need for it.

We've had a continued emphasis on getting the inventory built up. There had been delays and slips and, of course, the down-period puts us on track to have the inventory built up before we're into flying.

One area that's very important, we've reemphasized the ability to repair parts quickly. If you have a part out of service that's in repair, it draws down your need in your inventory, so we've been placing a lot of emphasis with working with (a) the vendors who repair the parts and (b) on a depot that we have that does local repairs. We plan to increase this year our depot capability some 30 to 40 percent, and we hopefully will have a full-up depot capability up to our plans within a few years.

All of those things lead us to have a feeling that we have a plan in place that will allow us to keep from cannibalization.

One other thing I'd like to emphasize, when we have a part that may not be in the inventory, our engineers, as part of the logistics program, are looking at those areas, not just what the numbers say, but what does it take to really change that part out; what's the impact if you don't have one, so we can put special emphasis on those areas that we ought to be assuring that, if there's any way in the world, to get parts in.

We say there may be cannibalization in the program. Our goal is to eliminate cannibalization. We just don't know how to have ev-

erything completely in place without spending an inordinate amount of money, and we're going to be learning, as the vehicle tells us which areas need more emphasis. We're already doing that, and we will continue to do that with the experience.

We feel with those areas and that emphasis, we should be able to have the logistics program back on track and not be in that support posture.

Mr. NELSON. Were you down to a position where spares were 65 percent?

Mr. UTSMAN. At the time, the inventory in late 1985 was only 60 percent of the layin that we'd initially——

Mr. NELSON. Sixty percent. And you want to get up to where you've got 90 percent of your spares?

Mr. UTSMAN. Well, we want to have 100 percent of the inventory. Where we get into the 90 percent, there is a calculation—and I emphasize it's only a calculation—called probability of sufficiency, which tries to estimate, when you go to the bin, given a set of assumptions, that you will be able to have a part there. When you go to that bin and there isn't a part there, it doesn't automatically mean you cannibalize. It means that you start looking at some options, like delaying installation of the part, can you accelerate a repair, can you take it out and repair and recycle it.

It does mean a perturbation to your operation. So we look at those, where there's an indication to perturbate, and try to put the resources on it. And we feel that by going through that process, that we will be able to cut our cannibalization rate substantially down. And our goal is to cut it to zero.

There are some, I might add, that really aren't a practical problem. The thing we emphasize in cannibalization is the safety aspect. We don't want to cannibalize where we're going into areas where it creates potential for latent damage.

Other parts, it's very easy to take one out, and that's where we're not putting the emphasis, but on those areas that will affect the other.

Mr. NELSON. Mr. Chairman, I think it's instructive to note here that where there was only an inventory of 60 percent of the spare parts, as was the condition at the time of the Challenger explosion, that really that was a condition that was born out of trying to put two pounds of potatoes into a one-pound sack, where the budgets were not provided in the past.

And it goes to the very essence of the work product of this committee, and that is that NASA has so much that it wants to do and needs to do to fulfill the dreams of Americans, which is to have the kind of space program that they want, and yet increasingly it tries to do that with an every-lessening budget that cheats on items, as it has in the past, that are essential for the safety of the program, such as spare parts, to the point that they were down to an inventory of 60 percent of their spare parts.

I think it's a very instructive lesson.

Now, Mr. Chairman, I have other questions on all these other subjects. What is your pleasure? Do you want me to go on or hold off until later?

Mr. ROE. We'll hold off until later, because we're coming down the list rapidly now, if you don't mind.

Mr. NELSON. All right. Do you want me just to submit the rest of these things?

Mr. ROE. Well, we will—why don't we get unanimous consent now? There is a series of questions that many members have, and I know we're not going to get them all today, so why don't we submit those for the record and submit them to Dr. Fletcher and his colleagues for a response to the committee?

Mr. NELSON. Okay. Particularly, Mr. Chairman, on questions of the overtime, on questions from the Rogers Commission report on the involvement of development contractors, all of which were included in our committee's report, questions of the shuttle processing contract, questions, I might say, that are raised because of the ambiguity of the answers back from NASA to our report.

So we will just——

Mr. ROE. I think that would be profitable. And if the gentleman would yield, we also have other things you haven't yet responded to, which we respect and understand. So we will coordinate that together. And I would say, in 30 days we'd look for another update at that point.

Mr. NELSON. Indeed, we will need the specificity of these answers before we start that set of hearings which you have directed us to do.

Mr. ROE. Right.

The Chair recognizes the distinguished gentleman from Pennsylvania, Mr. Walker.

Mr. WALKER. Thank you, Mr. Chairman.

Mr. Chairman, I guess that a number of members came here concerned about the report to us with regard to flight rate. I know it's my concern, and maybe the emphasis on that is something that is good out of this hearing.

But I have got to tell you that I was absolutely astonished to see that given the kind of in-depth study that you've done of the system, that you are still contending that there is a possibility at some point of flying this system 16 times a year. You know, I've read a lot of what you've put out. I've read the Rogers Commission stuff, and, you know, I just don't see any way that we can realistically assume that we will ever fly a three-orbiter fleet more than nine times a year or a four-orbiter fleet more than 12 times a year.

And I think that one of the things that NASA ought to do is to begin to deal with us realistically on that basis.

I guess the question is, isn't it reasonable to assume that that's correct, that we will never fly this system more than 12 times a year, even when we get to a four-orbiter fleet?

Admiral TRULY. Mr. Walker, I think it is. We believe, as I said in our study, that we can fly at rates of up to 13, 14 flights per year. We cannot fly at rates higher than that without the funds to implement some, for example, a fourth shuttle training aircraft or another shuttle training aircraft, simulator facilities, improvements in mission control.

So it's not a flippant proposal that we have in front of you. It's just a difference of perception and our opinion, I guess.

Mr. WALKER. But just in your answer there, you are defining some priorities of what we would have to do to increase the flight

schedule marginally, and probably deny ourselves the ability to do some other things that need to be done.

For example, if we cannot realistically assume that the system will ever fly more than 12 times a year, then it seems to me that one of the things we had better do is send that kind of signal right now to the commercial marketplace, so that they begin to plan to pick up the slack, and it ought not be just that we budget things here in this committee to let you buy ELVs.

I suggest that there's a whole commercial marketplace out there that will pick up some of that slack, if we send them the right kind of signals and begin to deal realistically. We've got to do that, and we've got to do it right.

It seems to me that if we're never going to fly this system more than 12 times a year, then it becomes incumbent upon us, as one of our priorities, to look to the second generation, because the fact is, this nation can't have a space station program and all the things we want to do and only be flying 12 times a year with a manned fleet well into the next century.

It makes absolutely no sense whatsoever to plan some of these things, if that's our real capability. So we'd better move to the second generation. There are just all kinds of decisions that flow from that that we've got to be realistic about, and it seems to me that your reply to us is really not being realistic, then, if we hold out the hope that at some point that the real schedule might be 16 flights a year.

And I just don't see anything in the report so far that suggests that that's even a reasonable assumption.

Dr. FLETCHER. Mr. Walker, I would like to comment, not because I'm an expert on flights per year, but just to review the bidding on where we stand on the, quote, 16 flights per year.

Admiral Truly had to make some estimate in planning, both for costing reasons in the Fiscal 1988 budget, but also for future customers, on what his best guess at the time was for a time period when we had four orbiters. And the answer, the first answer came out, 16 flights per year. But we're not going to do that until we're had a lot of experience, and I think very wisely built up a gradual program, so that we're not flying rapidly in the early days and we're beginning to get the hang of it.

Mr. WALKER. But obviously that's dependent upon having four orbiters, too.

Dr. FLETCHER. Oh, yes. Oh, yes, of course.

But let me say that I have a lot of confidence in Admiral Truly and his folks, but he's not committing to 16 flights per year.

Mr. WALKER. But you're planning based upon that, is my point.

Dr. FLETCHER. But we're hedging our bets.

Mr. WALKER. You know, the planning documents we see coming up here are based upon that kind of an assumption now, and that just makes no sense.

Dr. FLETCHER. Let me continue. Admiral Slay's committee—General Slay's—boy, he's going to be mad at me. [Laughter.]

I'll just call it Al Slay's committee, also I have a lot of respect for, and they came up with a number, 12 to 13 flights per year. The difference really was not in what they thought could be done. The difference was in how much downtime one or the other of the orbit-

ers would have. They assumed that one of them would be down most of the time; in other words, not the same one, but you'd be having troubles with one or the other of them most of the time, and that's how they got to the lower number.

They both could be wrong. I think the only way to really estimate that is to gradually build up, but to do exactly what you say, plan for a lower number—whether it's commercial ELVs or some other ELVs—but nevertheless, don't give up your honest answer, namely that we think we can do 16 flights per year if things work out as planned. It seems to me that Admiral Truly is taking a reasonable position on that.

Mr. WALKER. Well, and one other thing that concerns me in all of this is the fact that having gotten the commitment of money for the fourth orbiter that is incumbent in all of this, as I now see it, the money won't get released until August, so we are sitting around waiting for that money to get released. We are not even moving on that orbiter at this point. In the meantime, I see no particular desire to move toward one of the other directions that at least I suggested as a part of this committee, and that was, we look toward private funding as another source. We are now satisfied that the defense money that we got is good enough, and so therefore we'll sit around and wait for that to become available.

You know, I—from that standpoint, I think that there's a drift there that we ought to be trying to avoid, too.

Mr. ROE. Let me expand upon the gentleman's observation.

We are technically sitting with a crisis situation, and the crisis situation is the implementation of the existing satellites that are waiting to fly.

America is losing an enormous asset there in what the missions of those flight are. I think we can all agree to that. And we get to the pure science aspect, without being too redundant at the moment—the Mars Observer and the Hubble telescope and how we're going to do all this.

But I think he's striking at a very important point, and we've talked about funding being available not until August. That has come up before vis-a-vis the expertise of many of the contractors that are involved and being able to retain quality personnel that are familiar with and, in effect, helped born the system.

That bothers me considerably, because they're irreplaceable in the sense of having to retrain and the whole bit.

Do you see any effort being made or should there be an effort—could you tell this committee, maybe not today, but in due course—that in order to accelerate your efforts, what you would need in interim funding to begin to meet that need, because every day that we delay is simply exacerbating the other point?

[The material referred to follows:]

Based upon analyses conducted by NASA for pre-August funding requirements, NASA estimates that funding of $50 million starting on April 1, 1987, would improve the schedule delivery by four months. This funding would be utilized for critical path long lead items.

Mr. FLETCHER. Mr. Chairman, we'd be glad to provide that for the record, but I think we are just as worried about that problem as you, and we have already allocated—and you can correct me, Admiral Truly, if I'm offbase here—some money which is legally

available to provide, to the extent that we can, protection for those subcontracts and for the key personnel at Rockwell during this period between now and August.

It's my recollection that we have about $16.5 million allocated and possibly another $20 million, but we're arguing about whether it's really available, that we can hold those contractors, subcontractors and the main contractor together during this interim period.

Am I about right, Admiral Truly?

Mr. ROE. Okay. And do something else for us. Let me give you 30 days. In 30 days, can you respond to this committee as to what you would need to keep a reasonable level of effort to get to the end goal?

What's bothering me goes as follows, that if we're talking about—and again, the gentleman from Pennsylvania makes an excellent point—whether—we have to set goals for ourselves, because it's goals that drive direction, and that's why the February '88 date was selected, and without faulting what you're doing to this point—in fact, I'm enthused about what you're beginning to achieve—the point that bothers me the most is that as that pressure builds toward that February date, the American people are—they're not looking at that as just an interim target; they're looking at that date to fly.

And it seems to me to be extremely helpful to us if you could do it upfront and say to us, if we were to accelerate the program in the sense of getting our work done more rapidly in a better coordinated method, these are the kinds of help we would need at this point before August.

Can you tell us that in 30 days?

Dr. FLETCHER. Yes, we can, Mr. Chairman.

Mr. ROE. All right. We'll look for that.

Now whose next? The gentleman from Texas, Mr. Chapman.

Mr. CHAPMAN. Thank you, Mr. Chairman.

In this flight rate, Admiral Truly, let me ask you, in this flight rate discussion—and let's assume for a moment that 16 is a realizable goal—talking in terms of money, I understand that that is a factor not only of logistics but funding.

Do you have a feel at this time to achieve that rate, what additional funding NASA is going to need, without sacrificing any of the other programs, any other projects currently there? How much more money are we talking about to achieve that level of flight?

Admiral TRULY. I would have to get a detailed answer for you for the record, but we have laid out our outyear budget projections that do ramp up to 16 flights per year, and it does involve some capital investment in facilities. And I'm not saying these are precisely them. I mentioned a couple earlier, shuttle training aircraft, a shuttle carrier aircraft; in other words, getting the second 747, because as you know, we're going to have additional burdens on the ferry problem, because of the increased number of landings at Edwards rather than at the Cape.

So I'm afraid that I can't give you a detailed dollar answer now, but I'd be pleased to work it up for you.

[Information to be furnished follows:]

Since the hearing, we have updated our budget submittals post 51-L for 11-12 flights per year (utilizing four orbiters). Flight rates that result from this budget

planning will be developed with experience. If we are able to achieve greater flight rates, at that time, we will provide cost projections for those rates.

Mr. CHAPMAN. Well, I have—it seems that almost any program, at least, is probably a direct function of funding or the money that we commit to that program. The gentleman from Pennsylvania talks in terms, you know, 16 would never be a realistic number.

I think that's in the context of a certain funding equation. I sit here thinking, you know, if there's enough money, obviously if you commit the resources to it, you could fly 20 year, if you wanted to build another orbiter or if you wanted to put the money to do it.

And I'm doing this in the context of the most recent revelations or whatever about how much the space station is going to cost us. The committee was under the impression just a few days ago that $8 billion, probably at the most $10 billion, was the program cost there, and we find that that's not even in the ballpark.

And I guess what I'm asking is, could that kind of thing happen to us here, that we in all good faith plan or hopefully plan—or you plan on 16 flights a year; that word is given to the commercial community; the manifest is developed and based on that—and we find out later that we're looking at a multi-billion-dollar effort to accomplish that goal, and the committee arrives in a few months or a few years at a position saying that we can't do it? Or at least we can't do it without a substantially increased investment.

Admiral TRULY. Could I make one other observation, since there has been a good discussion here on the flight rate issue, I think, and it is one that we're going to need to deal with?

As I look at our flight rate projections, the flight rate builds up to 16 in Fiscal Year 1993, so we have a number of budget cycles, half a dozen total annual budget cycles to go through. The actual facts, the results from the slow buildup of the early year flight rate—which incidentally we are not in disagreement either with the NRC or with our internal study on the four flights in fiscal year 1988, nine flights in 1989, ten flights in 1990, the four in 1988 is low. Incidentally, because we are flying not at the start of the fiscal year, but those rates are not in contention, I don't think, with anybody. But we haven't demonstrated them yet. So I do think that there is budgetary and planning time to deal with this issue, as to whether we get to 14 or 16.

Dr. CHAPMAN. Well, I understand the time is there. The question is, what's the bottom line going to look like at that point, and could the same thing happen to us here perhaps, to accomplish that goal, that happened to us on the Space Station?

Mr. FLETCHER. Mr. Chapman, I think your question is valid, especially in view of the problems with the space station. I think what we'd better do is give you an estimate in the outyears of what we think we need to meet the 16 flights per year. We know Admiral Truly mentioned several things.

It's not a whole new launch complex or anything of that sort, but it is going to cost some money. It seems to me we ought to start from that list, and then you can ask questions about that list, is it adequate and so forth.

Mr. CHAPMAN. And I think that what the chairman is saying is, making the policy decision on what we can and cannot do is going

to, certainly at least to some extent, be a function of the funding required.

Dr. FLETCHER. Of course.

Mr. CHAPMAN. And in trying to do that planning, we need to be as careful and as thorough as we can be now, even though obviously we'll have experience factors as we go along to get better in each budget cycle.

I think I hear the chairman saying loud and clear that in setting this policy, we need to know everything we can know today to explore those options.

Thank you, Mr. Chairman.

Mr. ROE. I thank the gentleman for a very important point that we would like to get at as quickly as possible, and as I mentioned, we're going to get into—we're going to continue working with you continuously.

The budget cycle, for example, has been shortened by 30 days, but that's now the next year, so we don't really have the time to cogitate.

And I just want to leave with you, if you will indulge me one more minute, with the following: We have asked the Budget Committee for $220 million more this year, and the preponderance of those costs relate to the three expendable launch vehicles we spoke to.

Now why did we do that? Because the charter of NASA is the peaceful use of space and development of space. That's replete in the charter when the original legislation was passed.

Now if you could take your hat off for a moment and look at this committee, not being adversaries but being partners, we've got to convince the Congress and the American people that their investment in space is well-taken, and that it is the future of America and the Free World, without being loquacious.

We are sitting there worrying about what the Soviets are going to do, and we can't get the Mars Observer up, although we're ready to do it. That is a function of a decision-making policy that's got to be made. And the committee made that decision when they made the presentation to the Budget Committee. They did that.

We are terribly concerned, in the deeper reaches of space where our adversaries are going, we can't get the eye on that unless we can get that Hubble telescope. That's what we spent $1.2 billion to do in the first place. So we're trying to get that done.

The security of the nation depends on what kind of a fleet we can present, not five years from today based on 14 flights or 2 flights or 3 flights. The decision has to be made now.

The question on the Landsat, we're about to go out of business on the Landsat program, unless that decision is made now. And the assumption that private industry is going to pick up all the tabs and run out there and build these things is total, absolute, sheer, balderdash. It's not going to happen. It's not going to happen because the bottom line of income is not there, the revenues for them to be able to do it.

So really what we're saying is that as we focus on the shuttle as a vehicle, it's not the total driving policy that NASA must devote its attention to for the future of this country, is where we're trying to come from. And we said to the Budget Committee, it seems to be

axiomatic and logical that if we defer for two years the Mars program—and that is a fixed contract, estimates being $100 million at least for that time delay—why don't we put the $100 million up front on the expendable launch vehicle we need?

The science community can't do its work, because they haven't got the eyes to see with up there. But we're prepared to do it.

So what we really need in the next 30 days from you folks is a legitimate observation of the flight schedule that you see, based upon what other assets and resources you will need to be able to achieve that, right up front, because that's what the American people and that's what the Congress has got to know.

We're in competition to reduce that budget by—what is it—$108.6 billion in my mind—by $108 billion. The battle is not only the reduction of the budget by $108 billion; it's what priorities is Congress and the American people going to place on the needs of the nation.

As we fought the battle for the water resources, we carved out a piece of that, because it was critical to the future of the country. We can't live without water.

The question is, how important is our space effort and our high technology in the future of the country? What kind of priority will we place on that?

And that is being debated now, for the next two years at least. We need that information desperately. Please, without restraints, if you can do that—after all, the truth is the truth; what's up front ought to be up front as quickly as we can get it there. That's where we're coming from.

We want to thank you very much.

Dr. FLETCHER. Mr. Chairman, can I make a concluding remark?

Mr. ROE. Of course.

Dr. FLETCHER. I applaud what you've just said, and we will do our best to support that, because we're just as interested in making this program something America can be proud of, just as you are.

But I think I'd like to not pass up the opportunity to respond to this people problem that was raised by Mr. Scheuer and Mr. MacKay. It takes a long time to get people to work together. But one of the things it takes is leadership. And at this time, I would just like to remind you all that we have a first-rate leader sitting to my right, Admiral Truly, and he has brought together three Center Directors, who are also leaders, and they are people-oriented persons. They know how to deal with troops—I don't want to say "troop"—but our workforce and get them to respond, feel the responsibility for doing their job right, making sure that they feel the importance of the program, not to make mistakes, but also feel free to report up through channels when they see problems. I think Admiral Truly ought to be congratulated for what he's done so far.

Mr. ROE. Well, we congratulate both you and he and the members that you brought with you, the colleagues that you brought with you.

The Chair believes—and if I can make this statement—your report today is substantive; it's to the point; you're getting there. We're not going through a lot of mishmash. There are other things we're going to have to know and see.

But may I remind the distinguished Director, Administrator, that you haven't got a better, stronger supporter, including Admiral Truly, than you have in this committee. But in order for us to support this, we've got to understand, you've got to understand, and we've got to use all of the tools to say to the American people, "Listen, if you want to be in space, this is the direction we've got to go." And that's where we're coming from.

So we thank you very much. We will look for the questions that we will be sending you for a response. We think it's been productive and helpful to the committee, and we will be working with you further.

Thank you very much, and the hearing is adjourned.

[Whereupon, at 12:29 p.m., the hearing was adjourned.]

73-353 (48)